USE OF THE GLOBAL POSITIONING SYSTEM (GPS) AS A SUBSTITUTE FOR NON-DIRECTIONAL BEACONS (NDB) AND DISTANCE MEASURING EQUIPMENT (DME)

Purpose.

This Notice is issued to clarify the authorized uses of GPS in the U. S. National Airspace System (NAS). It is intended to amplify guidance contained in Advisory Circular (AC) 90-94, "GUIDELINES FOR USING GLOBAL POSITIONING SYSTEM EQUIPMENT FOR IFR EN ROUTE AND TERMINAL OPERATIONS AND FOR NONPRECISION INSTRUMENT APPROACHES IN THE U.S. NATIONAL AIRSPACE SYSTEM." The 14 Code of Federal Regulations (CFR) Part 91 requires air navigational equipment to be "appropriate to ground facilities to be used." The current U. S. NAS is based on NDB, Very-high frequency Omni-Range (VOR) and VOR/DME ground facilities. Therefore, depending on ground facilities to be used, in addition to VOR equipment, Automatic Direction Finding (ADF), and/or DME equipment OR an area navigation (RNAV) system which provides navigational performance equivalent to ADF, and/or DME equipment must be installed in an aircraft and must be operable for IFR flight operations in the NAS. Properly installed IFR-certificated GPS equipment, operated in accordance with AC 90-94 and this Notice, provides navigational performance equivalent to ADF or DME equipment, except for flying NDB instrument approach procedures.

Operations.

Subject to the restrictions below, operators in the U. S. NAS are authorized to use GPS equipment certified for IFR operations in place of ADF and DME equipment for the following operations:

Determining the aircraft position over a DME fix.

Flying a DME arc.

Navigating to/from an NDB.

Determining the aircraft position over an NDB.

Determining the aircraft position over a fix made up of a crossing NDB bearing.

Holding over an NDB.

Restrictions.

These operations are approved for GPS avionics approved for IFR, including multi-sensor systems with GPS sensor. This equipment must be properly installed and the provisions of the applicable FAA approved Aircraft Flight Manual (AFM), Flight

Manual supplement, or Approved Operations Manual should be met. The required integrity for these operations is provided by Receiver Autonomous Integrity Monitoring (RAIM), or an equivalent method. For air carrier operations, operations specification approval is required to use GPS.

Waypoints to be used for these operations must be retrieved from the GPS airborne database. The database must be current.

The GPS system must be operated within the guidelines contained in the AFM, Flight Manual Supplement or Approved Operations Manual.

The Course Deviation Indicator (CDI) must be set to terminal sensitivity when tracking GPS course guidance in terminal areas.

The NDB or DME ground facility which supports the charted requirement may be temporarily out of service.

Charting will not change to support these operations. Except for use as the primary instrument approach navigational source, charted requirements for ADF or DME can be met using the GPS system.

NOTE: An aircraft is not authorized to fly any IFR approach using GPS unless that instrument approach procedure is retrievable from the airborne database. Approach procedures that are omitted from the database can not be legally flown using GPS navigational equipment.

Guidance.

The following is provided as interim guidance until the new Advisory Circular 90-94 or the next issue of the Aeronautical Information Manual (AIM) are published. It is general and not specific to any particular GPS system. For specific guidance for your system refer to the approved AFM, Flight Manual Supplement or Approved Operations Manual or contact the manufacturer of your system.

To determine the aircraft position over a DME fix:

Verify aircraft GPS system integrity monitoring is functioning properly and indicates satisfactory integrity.

If the fix is identified by a five letter name which <u>is</u> contained in the GPS airborne database, you may select either the named fix as the active GPS waypoint (WP) or the facility establishing the DME fix as the active GPS WP.

> NOTE: When using a facility as the active WP, the only acceptable facility is the DME facility which is charted as the one used to establish the DME fix.

If this facility is not in your airborne database, you are not authorized to use a facility WP for this operation.

If the fix is identified by a five letter name which is not contained in the GPS airborne database, or if the fix is not named, you must select the facility establishing the DME fix or another named DME fix as the active GPS WP.

NOTE: An alternative, until all DME sources are in the database, is using a named DME fix as the active waypoint to identify unnamed DME fixes on the same course and from the same DME source as the active waypoint. CAUTION: Pilots should be extremely careful to ensure that correct distance measurements are used when utilizing this interim method. It is strongly recommended that pilots review distances for DME fixing during preflight preparation.

If you select the named fix as your active GPS WP, you are over the fix when the GPS system indicates you are at the active WP.

If you select the DME providing facility as the active GPS WP, you are over the fix when the GPS distance from the active WP equals the charted DME value and you are on the appropriate bearing or course.

To fly a DME arc:

Verify aircraft GPS system integrity monitoring is functioning properly and indicates satisfactory integrity.

You must select, from the airborne database, the facility providing the DME arc as the active GPS WP.

NOTE: The only acceptable facility is the DME facility on which the arc is based. If this facility is not in your airborne database, you are not authorized to perform this operation.

Maintain position on the arc by reference to the GPS distance in lieu of a DME readout.

To navigate to or from an NDB/compass locator:

NOTE: If the chart depicts the compass locator collocated with a fix of the same name, use of that fix as the active WP in place of the compass locator facility is authorized.

Verify aircraft GPS system integrity monitoring is functioning properly and indicates satisfactory integrity.

Select terminal CDI sensitivity in accordance with the AFM, AFM supplement, or pilot's guide if in the terminal area.

Select the NDB/compass locator facility from the airborne database as the active WP.

Select and navigate on the appropriate course to or from the active WP.

To determine the aircraft position over an NDB/compass locator:

Verify aircraft GPS system integrity monitoring is functioning properly and indicates satisfactory integrity.

Select the NDB/compass locator facility from the airborne database as the active WP.

> NOTE: When using an NDB/compass locator, that facility must be charted and be in the airborne database. If this facility is not in your airborne database, you are not authorized to use a facility WP for this operation.

You are over the NDB/compass locator when the GPS system indicates you are at the active WP.

To determine the aircraft position over a fix made up of an NDB/compass locator bearing crossing a VOR/LOC course:

Verify aircraft GPS system integrity monitoring is functioning properly and indicates satisfactory integrity.

A fix made up by a crossing NDB/compass locator bearing will be identified by a five letter fix name. You may select either the named fix or the NDB/compass locator facility providing the crossing bearing to establish the fix as the active GPS WP.

> NOTE: When using an NDB/compass locator, that facility must be charted and be in the airborne database. If this facility is not in your airborne database, you are not authorized to use a facility WP for this operation.

If you select the named fix as your active GPS WP, you are over the fix when the GPS system indicates you are at the WP as you fly the prescribed track from the non-GPS navigation source.

If you select the NDB/compass locator facility as the active GPS WP, you are over the fix when the GPS bearing to the active WP is the same as the charted NDB/compass locator bearing for the fix as you fly the prescribed track from the non-GPS navigation source.

To hold over an NDB/compass locator:

Verify aircraft GPS system integrity monitoring is functioning properly and indicates satisfactory integrity.

Select terminal CDI sensitivity in accordance with the AFM, AFM supplement, or pilot's guide if in the terminal area.

Select the NDB/compass locator facility from the airborne database as the active WP.

> NOTE: When using a facility as the active WP, the only acceptable facility is the NDB/compass locator facility which is charted. If this facility is not in your airborne database, you are not authorized to use a facility WP for this operation.

Select non-sequencing (e.g. "HOLD" or "OBS") mode and the appropriate course in accordance with the AFM, AFM supplement, or pilot's guide.

Hold using the GPS system in accordance with the AFM, AFM supplement, or pilot's guide.

NOTE: If the NDB is a compass locator charted with a collocated fix of the same name, use of that fix, from the airborne database, as the active waypoint in place of the NDB is authorized.

Planning: Good advance planning and intimate knowledge of your navigational systems are vital to safe and successful use of GPS in lieu of ADF and/or DME.

You should plan ahead before using GPS systems as a substitute for ADF and/or DME. You will have several alternatives in selecting waypoints and system configuration. After you are cleared for the approach is not the time to begin programming your GPS. In the flight planning process you should determine whether you will use the equipment in the automatic sequencing mode or in the non-sequencing mode and select the waypoints you will use.

When you are using your aircraft GPS system to supplement other navigation systems, you may need to bring your GPS control panel into your navigation scan to see the GPS information. Some GPS aircraft installations will present localizer information on the CDI whenever a localizer frequency is tuned, removing the GPS information from the CDI display. Good advance planning and intimate knowledge of your navigation systems are vital to safe and successful use of GPS.

The following are some factors to consider when preparing to install a GPS receiver in an aircraft. Installation of the equipment can determine how easy or how difficult it will be to use the system.

Consideration should be given to installing the receiver within the primary instrument scan to facilitate using the GPS in lieu of ADF and/or DME. This will preclude breaking the primary instrument scan while flying the aircraft and tuning, and identifying waypoints. This becomes increasingly important on approaches, and missed approaches.

Many GPS receivers can drive an ADF type bearing pointer. Such an installation will provide the pilot with an enhanced level of situational awareness by providing GPS navigation information while the CDI is set to VOR or ILS.

The GPS receiver may be installed so that when an ILS frequency is tuned, the navigation display defaults to the VOR/ILS mode, preempting the GPS mode. However, if the receiver installation requires a manual selection from GPS to ILS, it allows the ILS to be tuned and identified while navigating on the GPS. Additionally, this prevents the navigation display from automatically switching back to GPS when a VOR frequency is selected. If the navigation display automatically switches to GPS mode when a VOR is selected, the change may go unnoticed and could result in erroneous navigation and departing obstruction protected airspace.

GPS is a supplemental navigation system in part due to signal availability. There will be times when your system will not receive enough satellites with proper geometry to provide accurate positioning or sufficient integrity. Procedures should be established by the pilot in the event that GPS outages occur. In these situations, the pilot should rely on other approved equipment, delay departure, reroute, or discontinue IFR operations.